REMARKS

Claim 1 is rejected under 35 USC 103a as being unpatentable over Gu (US PUB 2003/0072393) in view of Shu (US PAT 7,039,382)

Claim 1 is amended to state that the at least one first calibration device is connected to the receiving circuit, and is serially connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals. No new matter is entered. In particular, this embodiment is supported as shown in Figures 1, 5, 6, and 10 of the present invention and the corresponding description.

Applicant points out that Shu does not teach or suggest such a configuration. In particular, Shu teaches in col 5, lines 18-28 a very different implementation, "For example, the modification of FIG.1 would entail substituting VI-dc with VI-LO and VQ-dc with VQ-LO, where VI-LO and VQ-LO are derived from the local oscillator signals, LO-I and LO-Q, respectively. To determine the DC components attributable to LO self mixing, each of the differential inputs can shorted and the output of the mixer measured, with LO-I and LO-Q alternately applied to the commutating mixer switch 66. Information provided by this measurement can be used to set the amplitude and/or phase of VI-LO and/or VQ-LO to compensate for any DC component added to the output due to LO self mixing."

Applicant points out that substituting VI-dc with VI-LO and VQ-dc with VQ-LO in Fig.1 by Shu is not equivalent or even similar to "the at least one first calibration device is serially connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals", as is claimed in currently amended claim 1 of the present invention. Specifically, Shu does not teach that a filter should be located between the receiving circuit and the mixer. No filter is seen or taught in the teachings of Shu. For at least this reason, applicant asserts that claim 1 of the present invention should not be found unpatentable over Gu (US PUB 2003/0072393) in view of Shu because neither Gu nor Shu teach at least one first calibration device being between the receiving circuit and the mixer and comprising a filter. Reconsideration of claim 1 is respectfully requested. Claims 2-4 are dependent upon claim 1 and should also be found allowable over the cited

references of Gu and Shu for at least the same reasons.

Claims 2-4 are rejected under 35 USC103a as being unpatentable over Gu (US PUB 2003/0072393) in view of Shu (US PAT 7,039,382) as applied to claim 1 above, and further in view of Wu et al. (US PAT 6,987,966 hereinafter, "Wu")

Applicant has amended claim 2 to correspond to the amendment made to claim 1. In particular, the filter of the at least one first calibration device is a notch filter or a high pass filter. No new matter is added.

As previously mentioned, claims 2-4 are dependent upon claim 1 and should also be found allowable over the cited references of Gu and Shu for at least the same reasons provided above concerning claim 1.

Additionally, concerning claim 2 of the present invention, the Examiner stated in the Office action mailed 2006/10/20 that "Wu teaches each of the first calibration devices comprises a notch filter or a high pass filter (col 48 lines 62-63 claim 3)." However, applicant points out that the notch filter or high pass filter of the at least one first calibration device in the present invention is for <u>reducing DC components</u> of the in-phase IF signals and the quadrature-phase IF signals. (see claim 1, emphasis added) This is in contrast to the teachings of Wu who teaches in col 44, lines 29-41 that "A three-stage polyphase filter can be used in each branch to suppress the fundamental frequency component of X_{IN} as well as the 3rd and 5th harmonics. The first stage of the polyphase filter can provide rejection of the fundamental frequency component. The second stage can provide rejection of the 3rd harmonic. The third stage can provide rejection of the 5th harmonic. At the same time, the higher harmonics of the input signal XIN can be suppressed with an RC lowpass filter in a buffer (not shown) preceding the polyphase filters." Wu illustrates this circuit configuration in Fig.40 and signal spectrums of the polyphase filters and low pass filter are shown in Fig.19a and Fig.19b. Applicant notes that neither the polyphase filters nor the low-pass filter reduce DC components of the in-phase IF signals and the quadrature-phase IF signals. The use of a low-pass filter by Wu is further evidence that Wu is not concerned with filtering DC components from the in-phase IF signals and the quadrature-phase IF signal as a low pass filter will pass the DC components directly. For at least these reasons, applicant asserts that claim 2

should not be found unpatentable over Gu in view of Shu, and further in view of Wu because none of the cited references teaches a notch filter or a high pass filter serially connected between the receiving circuit and the at least one mixer for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals, as is claimed in claim 2 of the present invention. Reconsideration of claim 2 is respectfully requested.

Concerning claim 3, applicant asserts that a similar argument also applies. The Examiner stated in the same Office action that "Wu further teaches at least one second calibration device electrically connected to the corresponding mixer for reducing DC offset generated by the mixer (col. 25 lines 19-22)"; however, applicant respectfully disagrees. Inspection of col 25, lines 19-22 of the disclosure of Wu is directly under the sub-title of "Programmable Low pass Filter". Furthermore, these lines by Wu state, "The first major spurs out of down conversion process is at 4 times the IF frequency. A self calibrated 4 fs polyphase filter can be used after the complex IF mixers to reduce the spurious and improve the linearity of the demodulator." Applicant notes that a low-pass filter will not reduce DC offset. Additionally, 4 times the IF frequency is not equivalent or similar to DC offset as DC offset is simply a direct current voltage (ie, non alternating / zero frequency). Wu is clearly concerned with filtering away spurs at 4 times the IF frequency and not with reducing DC offset generated by the mixer. For at least this reason, applicant asserts that claim 3 should not be found unpatentable over Gu in view of Shu, and further in view of Wu because none of the cited references teaches at least one second calibration device electrically connected to the corresponding mixer for reducing DC offset generated by the mixer. Reconsideration of claim 3 is respectfully requested.

Concerning claim 4, applicant points out that claim 4 is dependent upon claim 3, which is believed allowable because of at least the above provided reasons. Therefore, claim 4 should also be found allowable for at least the same reasons. In the same Office action, the Examiner stated that Wu further teaches in col 46 lines 51-67 that each of the second calibration devices comprises a controllable current mirror as described in claim 4 of the present invention. However, applicant points out the bandgap calibration circuit described by Wu in col 46 lines 51-67 is not for reducing DC offset generated by the mixer and Wu does not teach how the circuit structure of the bandgap calibration circuit could be utilized to reduce DC offset generated by the mixer. The focus of Wu is stated in line 65 being "the result is a current I_{OUT} displays a (ideally) zero

temperature coefficient."

In addition to not performing the claimed function, applicant additionally asserts there is no motivation to combine said teachings of Wu with those of Gu and Shu in order to result in the present invention. It appears that the Examiner has unfairly combined a circuit structure of Wu (the bandgap calibration circuit) that appears similar to a circuit structure of the present invention (the controllable current mirror of each of the calibration devices) with other references (Gu and Shu) to reject the present invention. However, there is no motivation provided by Wu to direct a person skilled in the art to utilize the circuit structure of the bandgap calibration circuit to reduce DC offset generated by the mixer in the combination of Gu and Shu. Further inventive process would be required to realize that such a circuit structure could be utilized for such a purpose. For at least these reasons applicant asserts that claim 4 should not be found unpatentable over Gu in view of Shu, and further in view of Wu because none of the cited references teach the claimed structure for reducing DC offset generated by the mixer, and there is no motivation to use the circuit structure of the bandgap reference circuit taught by Wu for this purpose when combined with Gu and Shu. Reconsideration of claim 4 is respectfully requested.

Claims 5-6 are rejected under 35 USC 103a as being unpatentable over Gu (US Pub 2003/0072393) in view of Wu et al. (US Pat 6,987,966 hereinafter, "Wu")

Concerning claim 5, the Examiner stated in the same Office action that "In the same field of endeavor, Wu teaches at least one second calibration device electrically connected to the corresponding mixer for erasing DC offset generated by the mixer (col. 25 lines 19-22)".

However, applicant respectfully disagrees. As mentioned above, inspection of col 25, lines 19-22 of the disclosure of Wu is directly under the sub-title of "Programmable Low pass Filter". Furthermore, these lines by Wu state, "The first major spurs out of down conversion process is at 4 times the IF frequency. A self calibrated 4 fs polyphase filter can be used after the complex IF mixers to reduce the spurious and improve the linearity of the demodulator." Applicant notes that a low-pass filter will not erase DC offset as is claimed in claim 5 of the present invention. Additionally, 4 times the IF frequency is not equivalent or similar to DC offset as a DC offset is simply a direct current voltage (ie, non alternating / zero frequency). Wu is clearly teaching

filtering away spurs at 4 times the IF frequency and not erasing DC offset generated by the mixer. For at least this reason, applicant asserts that claim 5 should not be found unpatentable over Gu in view of Wu because neither of the cited references teaches at least one second calibration device electrically connected to the corresponding mixer for erasing DC offset generated by the mixer. Reconsideration of claim 5 is respectfully requested.

Concerning claim 6, applicant firstly notes that claim 6 is dependent upon claim 5 believed allowable over the cited references for the reasons provided above. Therefore, claim 6 should also be found allowable for at least the same reasons. Additionally, similar to the argument provided above for claim 4, applicant asserts that Wu does not teach the claimed structure of claim 6 for erasing LO leakage generated when the pair of quadrature signals pass the mixer, and there is no motivated to use the circuit structure of the bandgap reference circuit taught by Wu for this purpose when combined with Gu. Specifically, applicant points out the bandgap calibration circuit described by Wu in col 46 lines 51-67 is not for erasing LO leakage and Wu does not teach how the circuit structure of the bandgap calibration circuit could be utilized for this purpose. The focus of Wu is stated in line 65 being "the result is a current I_{OUT} displays a (ideally) zero temperature coefficient."

In addition to not performing the claimed function, applicant additionally asserts there is no motivation to combine said teachings of Wu with those of Gu in order to result in the present invention as claimed in claim 6. It appears that the Examiner has unfairly combined a circuit structure of Wu (the bandgap calibration circuit) that appears similar to a circuit structure of the present invention (the controllable current mirror of each of the calibration devices) with another reference (Gu) to reject the present invention. However, there is no motivation provided by Wu to direct a person skilled in the art to utilize the circuit structure of the bandgap calibration circuit to erase LO leakage generated when the pair of quadrature signals pass the mixer in combination with Gu. For at least these reasons applicant asserts that claim 6 should not be found unpatentable over Gu in view of Wu because none of the cited references teach the claimed structure for erasing LO leakage, and there is no motivation to use the circuit structure of the bandgap reference circuit taught by Wu for this purpose when combined with Gu. Reconsideration of claim 6 is respectfully requested.

Claims 7-8 are dependent upon base claim 5 and should also be found allowable over the

cited references of Gu and Wu for at least the same reasons provided above concerning claim 5.

Claims 7-11 are rejected under 35 USC 103a as being unpatentable over Gu (US Pub 2003/0072393) in view of Wu et al. (US Pat 6,987,966 hereinafter, "Wu") and further in view of Shu (US Pat 7,039, 382)

As previously mentioned, claims 7-8 are dependent upon base claim 5 and should also be found allowable over the cited references of Gu, Wu, and Shu for at least the same reasons provided above concerning claim 5.

Additionally, concerning claim 7, the Examiner stated in the same Office action that "Shu teaches at least one first calibration device for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals (col. 5lines 9-17).

Applicant has amended claim 7 similar to the above-described amendment made to claim 1. In particular, in claim 7, the at least one first calibration device is connected to the receiving circuit, and is serially connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the in-phase IF signal and the quadrature-phase IF signals. No new matter is entered. In particular, this embodiment is supported as shown in Figures 1, 5, 6, and 10 of the present invention and the corresponding description.

An argument similar to that presented above for currently claim 1 also applies to currently amended claim 7. Specifically, Shu teaches in col 5, lines 18-28 a very different implementation than claimed in claim 7. "For example, the modification of FIG.1 would entail substituting VI-dc with VI-LO and VQ-dc with VQ-LO, where VI-LO and VQ-LO are derived from the local oscillator signals, LO-I and LO-Q, respectively. To determine the DC components attributable to LO self mixing, each of the differential inputs can shorted and the output of the mixer measured, with LO-I and LO-Q alternately applied to the commutating mixer switch 66. Information provided by this measurement can be used to set the amplitude and/or phase of VI-LO and/or VQ-LO to compensate for any DC component added to the output due to LO self mixing." (col 5, lines 18-28)

Applicant points out that substituting VI-dc with VI-LO and VQ-dc with VQ-LO in Fig.1 by Shu is not equivalent or even similar to "the at least one first calibration device is serially

connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals", as is claimed in currently amended claim 7 of the present invention. Specifically, Shu does not teach that a filter should be located between the receiving circuit and the mixer. No filter is seen or taught in the teachings of Shu. For at least these reasons, applicant asserts claim 7 should not be found unpatentable over Gu in view of Wu and further in view of Shu. Reconsideration of claim 7 is respectfully requested.

Claim 8 is dependent upon claim 7 and should be found allowable for at least the same reasons. Additionally, claim 8 is amended similar to the above-described amendment made to claim 2 to state the filter is a notch filter or a high pass filter and thereby correspond to the amendments made to claim 7. No new matter is added.

Concerning claim 8 of the present invention, the Examiner stated in the same Office action that "Wu further teaches each of the first calibration devices comprises a notch filter or a high pass filter (col 48 lines 62-63 claim 3)." However, applicant points out that the notch filter or high pass filter of the at least one first calibration device in the present invention is for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals. This is in contrast to the teachings of Wu who teaches in col 44, lines 29-41 that "A three-stage polyphase filter can be used in each branch to suppress the fundamental frequency component of X_{IN} as well as the 3rd and 5th harmonics. The first stage of the polyphase filter can provide rejection of the fundamental frequency component. The second stage can provide rejection of the 3rd harmonic. The third stage can provide rejection of the 5th harmonic. At the same time, the higher harmonics of the input signal XIN can be suppressed with an RC lowpass filter in a buffer (not shown) preceding the polyphase filters." Wu illustrates this circuit configuration in Fig.40 and signal spectrums of the polyphase filters and low pass filter are shown in Fig.19a and Fig.19b. Applicant notes that neither the polyphase filters nor the low-pass filter erase DC components of the in-phase IF signals and the quadrature-phase IF signals. The use of a low-pass filter by Wu is further evidence that Wu is not concerned with filtering DC components from the in-phase IF signals and the quadrature-phase IF signal as a low pass filter will pass the DC components directly. For at least these reasons, applicant asserts that claim 8 should not be found unpatentable over Gu in view of Shu, and further in view of Wu because none of the cited references teaches a notch filter or a

high pass filter serially connected between the receiving circuit and the at least one mixer for reducing DC components of the in-phase IF signals and the quadrature-phase IF signals, as is claimed in claim 8 of the present invention. Reconsideration of claim 8 is respectfully requested.

Concerning claim 9, applicant has amended claim 9 to include the limitation, "<u>wherein the calibration device is serially connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the pair of quadrature IF signals</u>". No new matter is entered. Similar to the above provided argument for the allowability of claim 1 with respect to the cited references, applicant asserts that this amendment to claim 9 should render claim 9 allowable over the cited references of Wu, Gu, and Shu. Specifically, the reason is because none of the cited references teaches at least one calibration device electrically connected to the corresponding mixer for erasing DC offset generated by the mixer.

An argument similar to that presented above for currently claim 1 also applies to currently amended claim 9. Specifically, Shu teaches in col 5, lines 18-28 a very different implementation than claimed in claim 9. "For example, the modification of FIG.1 would entail substituting VI-dc with VI-LO and VQ-dc with VQ-LO, where VI-LO and VQ-LO are derived from the local oscillator signals, LO-I and LO-Q, respectively. To determine the DC components attributable to LO self mixing, each of the differential inputs can shorted and the output of the mixer measured, with LO-I and LO-Q alternately applied to the commutating mixer switch 66. Information provided by this measurement can be used to set the amplitude and/or phase of VI-LO and/or VQ-LO to compensate for any DC component added to the output due to LO self mixing." (col 5, lines 18-28)

Applicant points out that substituting VI-dc with VI-LO and VQ-dc with VQ-LO in Fig.1 by Shu is not equivalent or even similar to "the calibration device is serially connected between the receiving circuit and the at least one mixer and comprises a filter for reducing DC components of the pair of quadrature IF_signals", as is claimed in currently amended claim 9 of the present invention. Specifically, Shu does not teach that a filter should be located between the receiving circuit and the mixer. No filter is seen or taught in the teachings of Shu.

In addition, the two polyphase filters 360, 362 of Wu are "to remove the first two odd harmonics of the signal. The remaining harmonics can be filtered with an on chip tunable low

pass filter." Wu does not teach erasing DC offset generated by the mixer. For at least these reasons, applicant asserts that currently amended claim 9 should not be found unpatentable in view of the teachings of Gu, Shu, and Wu. Reconsideration of claim 9 is respectfully requested. Claims 10-11 are dependent upon claim 9 and should also be found allowable for at least the same reason.

Sincerely yours,

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